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STO TECHNICAL REPORT

TR-HFM-211

# **An Applied-Scientific Approach to Field Assessments – “Try It Out” – A Field Guide for Practitioners**

(Une approche scientifique des évaluations de terrain –  
« Essayer le » – Un guide de terrain à  
destination des praticiens)

This Technical Report documents the findings of Task Group 221  
for the STO Human Factors and Medicine Panel.



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# The NATO Science and Technology Organization

Science & Technology (S&T) in the NATO context is defined as the selective and rigorous generation and application of state-of-the-art, validated knowledge for defence and security purposes. S&T activities embrace scientific research, technology development, transition, application and field-testing, experimentation and a range of related scientific activities that include systems engineering, operational research and analysis, synthesis, integration and validation of knowledge derived through the scientific method.

In NATO, S&T is addressed using different business models, namely a collaborative business model where NATO provides a forum where NATO Nations and partner Nations elect to use their national resources to define, conduct and promote cooperative research and information exchange, and secondly an in-house delivery business model where S&T activities are conducted in a NATO dedicated executive body, having its own personnel, capabilities and infrastructure.

The mission of the NATO Science & Technology Organization (STO) is to help position the Nations' and NATO's S&T investments as a strategic enabler of the knowledge and technology advantage for the defence and security posture of NATO Nations and partner Nations, by conducting and promoting S&T activities that augment and leverage the capabilities and programmes of the Alliance, of the NATO Nations and the partner Nations, in support of NATO's objectives, and contributing to NATO's ability to enable and influence security and defence related capability development and threat mitigation in NATO Nations and partner Nations, in accordance with NATO policies.

The total spectrum of this collaborative effort is addressed by six Technical Panels who manage a wide range of scientific research activities, a Group specialising in modelling and simulation, plus a Committee dedicated to supporting the information management needs of the organization.

- AVT Applied Vehicle Technology Panel
- HFM Human Factors and Medicine Panel
- IST Information Systems Technology Panel
- NMSG NATO Modelling and Simulation Group
- SAS System Analysis and Studies Panel
- SCI Systems Concepts and Integration Panel
- SET Sensors and Electronics Technology Panel

These Panels and Group are the power-house of the collaborative model and are made up of national representatives as well as recognised world-class scientists, engineers and information specialists. In addition to providing critical technical oversight, they also provide a communication link to military users and other NATO bodies.

The scientific and technological work is carried out by Technical Teams, created under one or more of these eight bodies, for specific research activities which have a defined duration. These research activities can take a variety of forms, including Task Groups, Workshops, Symposia, Specialists' Meetings, Lecture Series and Technical Courses.

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- Lisbon (PRT) at the Joint Analysis and Lessons Learned Centre (JALLC); and
- Soesterberg (NLD) at TNO.

The directors and points of contact of these establishments are gratefully thanked for their hospitality and logistical support.

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# An Applied-Scientific Approach to Field Assessments – “Try It Out” – A Field Guide for Practitioners (STO-TR-HFM-211)

## Executive Summary

In NATO and in many nations a wide range of innovations and improvements in technology, information processes and organisational structures are being developed and tried out by the military in the context of new operational settings and requirements. When it comes to deciding whether an innovation or intended improvement actually adds to the operational performance this assessment guide is intended to support practitioners, in this case commanders and staff.

Rather than going for high level scientific rigor this guide aims to provide a practical method to improve assessment efforts that might be based on simple methods of just observing if it works. Investing in simple measures to improve the assessment practise may reduce the number and magnitude of potential errors and misleading conclusions. At the same time such efforts will increase the value of the insights coming from experimentation in natural settings – be it field trials, field experiments, tests or evaluations.

This guide is based on experience of the the NATO STO Task Group (HFM-211) with assessment in practice and is based on knowledge of scientific rigour. Starting from the premise that there is an identified need coming from the commander or staff or other stakeholder for an assessment to support a grounded decision, the Guide takes its user in five steps from problem exploration to planning and execution to reporting:

- **Framing the Question** – In dialogue with the problem owner, often the commander, the basic aspects of the question the underlying problem space and available resources are identified.
- **Initial Problem Space Analysis** – Based on a deeper analysis of the question and the problem space a brief initial planning of the assessment task is developed by the assessment team. This should allow the commander to decide on the size of the assessment and the available resources.
- **Detailed Assessment Planning** – The assessment team conducts an in depth planning of the assessment task. This includes development of a detailed assessment plan with identified indicators and corresponding procedures to collect information.
- **Preparation and Execution** – The assessment team manages the practical preparation, setup of the experimentation, and conducts the data collection.
- **Analysis and Report** – The analysis is directed to answering the formulated assessment question. Also an assessment must be made of the quality of the obtained data, in order to value the results.

The five steps are supported by a set of twenty-two leading questions that are supposed to trigger the considerations to be addressed in the assessment process. The Guide also takes into account that time and resources of the staff are limited due to primary operational tasks and, moreover, that no scientific support is available to support the assessment. Modelled against the generic command process, familiar to the intended practitioners, the assessment process can be incorporated in the staff's daily schedule and mimic the quality control steps from the command process. While this Guide is based on our practical experiences it has not been tested or validated in practice by the Task Group. Feedback from defence colleges and Training and Evaluation staffs is highly welcomed.

# Une approche scientifique des évaluations de terrain – « Essayer le » – Un guide de terrain à destination des praticiens (STO-TR-HFM-211)

## Synthèse

Les militaires de l'OTAN et de nombreux pays élaborent et essaient une large gamme d'innovations et d'améliorations en matière de technologie, procédés d'information et structures organisationnelles pour faire face à de nouveaux paramètres et de nouvelles exigences opérationnelles. Le présent guide d'évaluation est conçu pour aider les praticiens, en l'occurrence les commandants et le personnel, à décider si une innovation ou une amélioration prévue renforce réellement les performances opérationnelles.

Au lieu de préconiser une rigueur scientifique extrême, ce guide propose une méthode pratique qui pourrait reposer sur de simples observations des résultats. L'adoption de mesures simples améliorant la pratique d'évaluation est susceptible de réduire le nombre et l'étendue des erreurs potentielles et des conclusions trompeuses. Elle augmentera la valeur des informations issues de l'expérimentation dans un cadre naturel, qu'il s'agisse d'essais ou d'expériences sur le terrain, d'essais de laboratoire ou d'évaluations.

Ce guide s'appuie sur l'expérience du groupe de travail HFM-211 de la STO de l'OTAN en matière d'évaluation pratique et sur la rigueur scientifique. Partant du principe que le commandant, le personnel ou un autre acteur a besoin d'une évaluation pour prendre une décision justifiée, le guide présente cinq étapes allant de l'étude du problème jusqu'au compte rendu, en passant par la planification et l'exécution :

- **Cerner la question** – Les aspects fondamentaux de la question, le domaine sous-jacent du problème et les ressources disponibles sont identifiés en collaboration avec la personne chargée de résoudre le problème, fréquemment le commandant.
- **Analyse initiale du domaine du problème** – A partir d'une analyse approfondie de la question et du domaine du problème, l'équipe d'évaluation élabore un plan sommaire initial de la tâche d'évaluation, ce qui devrait permettre au commandant de décider de l'ampleur de l'évaluation et des ressources disponibles.
- **Planification détaillée de l'évaluation** – L'équipe d'évaluation réalise une planification approfondie de la tâche d'évaluation. Il s'agit notamment d'établir un plan d'évaluation détaillé avec des indicateurs identifiés et des procédures de recueil d'information.
- **Préparation et exécution** – L'équipe d'évaluation gère la préparation pratique et la mise en place de l'expérimentation et dirige le recueil des données.
- **Analyse et compte rendu** – L'analyse est orientée de manière à répondre à la question d'évaluation formulée. Il est également impératif d'évaluer la qualité des données obtenues, afin d'évaluer les résultats.

Ces cinq étapes prennent appui sur un jeu de vingt-deux questions principales censées indiquer les points à traiter au cours du processus d'évaluation. Le guide tient compte du fait que le temps et les ressources du personnel sont limités par des tâches opérationnelles primaires et que, par ailleurs, aucun soutien scientifique n'est mis à disposition lors de l'évaluation. Etabli d'après le processus de commandement général, auquel les praticiens concernés sont habitués, le processus d'évaluation peut être intégré dans le programme quotidien

du personnel et imite les étapes de contrôle de la qualité du processus de commandement. Ce guide se fonde sur nos expériences pratiques, mais n'a pas été testé ni validé en pratique par le groupe de travail. Nous apprécierions un retour d'expérience des collègues de la défense et des équipes de formation et d'évaluation de l'instruction.



# **AN APPLIED-SCIENTIFIC APPROACH TO FIELD ASSESSMENTS – “TRY IT OUT” – A FIELD GUIDE FOR PRACTITIONERS**

## **1.0 INTRODUCTION**

### **1.1 Background**

In NATO and in many nations a wide range of innovations and improvements in technology, information processes and organisational structures are being developed and tried out by the military in the context of new operational settings and requirements. Experimentation and evaluation programs have been setup to analyse and demonstrate the added value and effectiveness of new developments such as new operational concepts, new information systems, new organisational structures, etc.

Assessment of effectiveness of innovations and intended improvements of operational functioning has a long history with many systematic approaches, such as, e.g. The Army Command and Control Evaluation System – ACCES [1], and U.S. Navy Headquarters Effectiveness Analysis Tool (HEAT) [2]. In addition, different Codes of Best Practice (such as GUIDEx [3], NATO Code of Best Practice of C2 Assessment [4]) and reviews [5] lay down the basic principles of assessments conducted by teams of qualified scientists and their staff. Existing approaches and codes provide adequate guidance and sources of information, but at the same time they often demand or assume a high level of scientific control, which is difficult to obtain in military practice. Still driven by operational needs and perceived problems of effectiveness operational practice constantly performs exploration of and experimentation with, amongst others, new technologies, support systems, new ways of working, new organizational structures for current or changed conditions. Doing this light-heartedly might lead to missed opportunities or just false conclusions and hindsight costs.

As we have observed over the years while working with the military there seems to be a gap between the operational practice of assessment and the scientific rigor that is being advocated in the documents mentioned above. In practice experimenting with, e.g. new tools or ways of working is often based on informal methods to get an impression of the added value of the new thing and deciding on that basis. At the same time we have seen that there is an appreciation and a need for more solid methods if these would fit the always limited time and resources of operational practice. To respond to this need we have set up a Task Group (HFM-211) to develop an approach for field assessments, maintaining that scientific rigor is beyond the possibilities of operational practice and therefore starting from the practice side exploring how to improve the quality of assessment within the reach of operational practice. Investing in the quality of the operational practice of assessment might reduce potential errors of misjudging the effectiveness of certain developments and at the same time increase the value of the insights coming from such experimentation.

The guide is based on a problem analysis approach supported by a set of leading questions to trigger and focus the thinking about the assessment. The questions represent important considerations to be addressed during the planning, execution and evaluation of an assessment task. The term ‘assessment’ is being used differently in different contexts. Here assessment is the process of making a measurement and judgment of the value or worth of an entity or new situation (e.g. a technology, process, program, procedure) in the context of the functioning of a system, group, unit). An essential element of the assessment is creating a set-up for the assessment as a trial or experiment in such a way that conclusions can be drawn about the problem stated or question asked. In military context assessment is also used in the context of ‘operations assessment’ which is about “continually monitor the Operational Environment (OE) and assess the progress of the operation toward the desired end state” [6]. While sometimes used interchangeably, the label ‘evaluation’ is mostly being given to summative assessments to

determine the relevance and fulfilment of objectives, development efficiency, effectiveness, impact and sustainability. Evaluation practice provides useful ideas and methods for assessment (see Refs. [7] and [8]).

The objective of this report is to compile a practical approach to assessment in natural settings, such as field trials, field experiments, tests or evaluations, in the form of a guide for practitioners – commanders and tasked personnel.

## **1.2 Approach**

The Task Group was preceded by an exploratory team that organised a workshop in Soesterberg, Netherlands, March 2010, to explore the issues of C2 functioning assessments in an operational context. In a supporting TNO-report “Elements of a Field Guide for Practitioners” (TNO-DV 2011 IN017) possible elements of such a guide were listed and reviewed. It was concluded that central to the Field Guide should be the concept of ‘dialogue’ between the operator and researcher. Questions were drawn up in the Socratic tradition. The overall purpose of these questions is to challenge accuracy and completeness of thinking in a way that acts to move people towards their ultimate goal. The proposal was that such questions approach should be the core of the Field Guide. The Exploratory team produced the Terms of Reference for the Task Group.

The Task Group gathered in seven meetings from November 2010 to November 2013, and invited external experts to discuss the intended product. In the first meetings all elements of formal and informal assessment were explored. In the final four meetings convergence of all aspects was aimed for in a format that would suit practitioners. This resulted in a basic structure and content of a draft report.

Reflection on this result suggested that it was still too academic and less fitting the intended practitioners view. This required some rethinking of the approach. The main step to the current version of the Field guide was to link the assessment process to the command process as an analogous process. The assumption was that linking to a natural way of practitioners’ thinking of clear progressing steps and quality control elements with a commander (or other leader) as the problem owner and decision maker concerning direction and extends of the assessment.

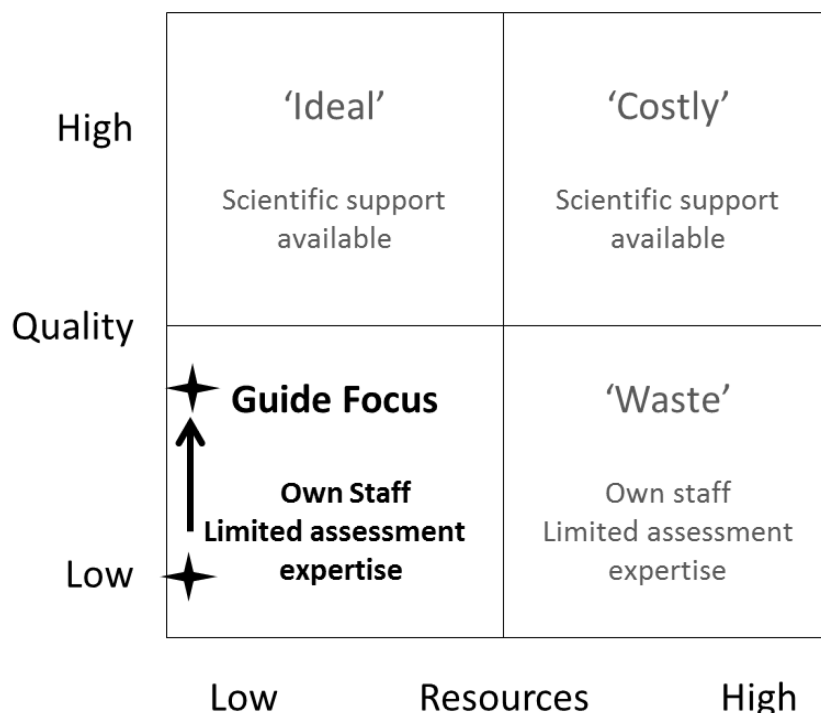
The Guide is based on scientific and operational experiences and insights of the Task Group participants, but must be seen as a Concept document. No validation in military settings has been done so far. The Guide is open for further development and ‘trying it out’.

## **1.3 Positioning of the Guide**

Scientific approaches to assessment seek high quality of assessments, while the practical context of assessments can be characterized as having little time and resources available for performing assessments. Quality in the latter assessments may be suboptimal, with the risk of accepting false positives or rejecting an opportunity. Operators could benefit to achieve methodologically stronger results by increasing the quality of their assessments.

Taking quality of assessment as one dimension and size of resources as the other our perspective is that higher levels of quality can primarily be assured by involving individuals with training in the scientific method. However, for practical reasons it is not possible or feasible to have scientific support in all assessment tasks. Depending on the problem to solve, the need of resources varies. The intended use and audience of the Guide, we envisaged, are operational and tactical levels commanders and staff and a situation in which there is no support from science to address a problem by a dedicated assessment process. The guide is intended to work at

the practitioner’s side and provide ways to improve the quality of assessment while staying within the possibilities of practical conditions. This leads to four quadrants with is illustrated in the figure below (Figure 1).



**Figure 1: The Scope of the Assessment Guide.**

Thus, given practice limitations and limited resources one would end up in the lower left quadrant. The Guide focusses on that quadrant aiming to improve the quality of those assessments.

The following conditions we assume:

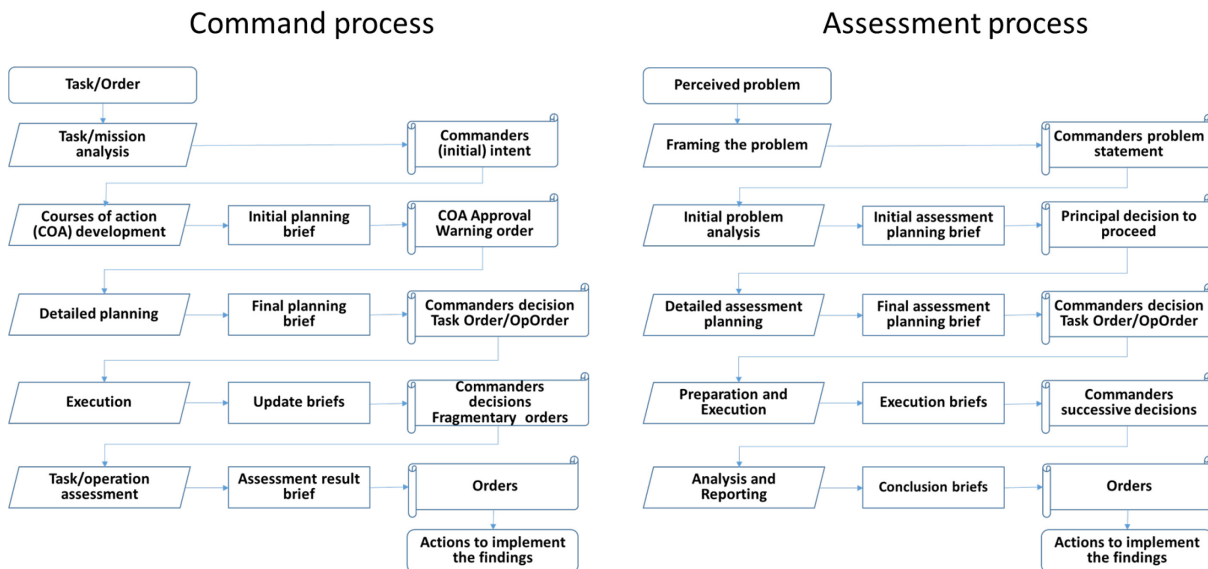
- A need for an assessment to support a grounded decision has emerged for instance resulting for a perceived problem to be addressed, or need to explore the optimal implementation of new equipment or new process and procedure.
- Time and resources of the staff are limited due to primary, operational, tasks. Thus the commander has to make a decision on if (is it worthwhile) the assessment should be done and what resources are available for that.
- No scientific support is available to support the assessment.
- Assessment is performed by an empirical approach, be it straightforward trying out or ‘experimenting’ or testing with few or many participants.

Given this context of limited possibilities the guide should provide the commander and the tasked personnel a relatively simple and understandable procedure (therefore no templates) to add quality to the assessment. Quality principles may relate to, for instance, understanding the problem, formulating alternative hypotheses, triangulation of methods (using multiple methods).

For the purpose of this guide, we use the term commander to indicate the individual who has the mandate to make the adequate decisions to bring the process forward and has the responsibility to initiate an assessment. We assume in this guide that the commander has a stake in the assessment even if it is not the commander who is the “owner of the problem.” In addition, the commander has the final say on what resources are available for the assessment. Therefore, the assessment process is designed around successive decisions to be made by the commander. In practice, it might be necessary to get approval from other stakeholders – “problem owners” – as well.

#### 1.4 The Assessment Process Adapted to the Staff Process

A generic command and control/staff process is used as the basis for outlining an assessment process. It is important to note that the process is generic and conceptual. Specific processes for tactical and operational command may vary between countries and units. In addition, terms describing different sub- processes may also vary. For the purpose of this guide, the generic model below is assumed to capture the essence (Figure 2). In practice, one might need to adjust to the command process that is being used in the unit involved.



**Figure 2: The Generic Command and Control (Staff) Process and the Analogues Assessment Process.**

The command process is assumed to start and end with the commander; the staff provides the information and options for the commander to decide upon. This staff work comprises the detailing and extending of the tasking, gathering the relevant information and organising the processes to provide that information. Regular briefs are undertaken in which the commander is given adequate and sufficient information to make decisions on how to proceed.

The process is initiated when an order or a task is received by the unit. An initial task/mission analysis is performed which results in a stated “commanders (initial) intent”. Based on “commander’s intent” and contextual factors such as the enemy and the weather an initial planning is executed in which different options – Courses Of Actions (COA) – to solve the task are developed and compared. After the initial planning brief,



the commander takes a principal decision on how to execute the task – to approve one of the COAs. This is the foundation for distributing warning orders and the subsequent detailed planning. The detailed planning is about the successive development of an order – for example an OPLAN or OPORD.

The result of the detailed planning is presented in a final planning brief<sup>1</sup>. Based on this, the commander makes the formal decision to execute the task according to the order outlined in the planning process. The execution is then managed by the operations section of the staff. Regular update briefs are given in order for the commander to make necessary decisions based on how the situation unfolds. When the task is completed, a task/operation evaluation should be undertaken and summarized in lesson learned briefs/documentation. Based on identified lessons learned, the commander makes necessary decisions to address the issues identified in lessons learned.

The corresponding assessment process outlined in this guide is modelled on the command process described above. Consequently it includes similar successive steps each concluded by a decision on how to proceed. An overview of the two processes is shown in Figure 2.

## 1.5 Outline of the Guide

The five steps identified are summarized below and are described in more detail in the Guide, which is presented in Section 2.0 of this report (a short hand-out overview of the whole process – the five steps and the twenty-two leading questions – can be found in Figure 4):

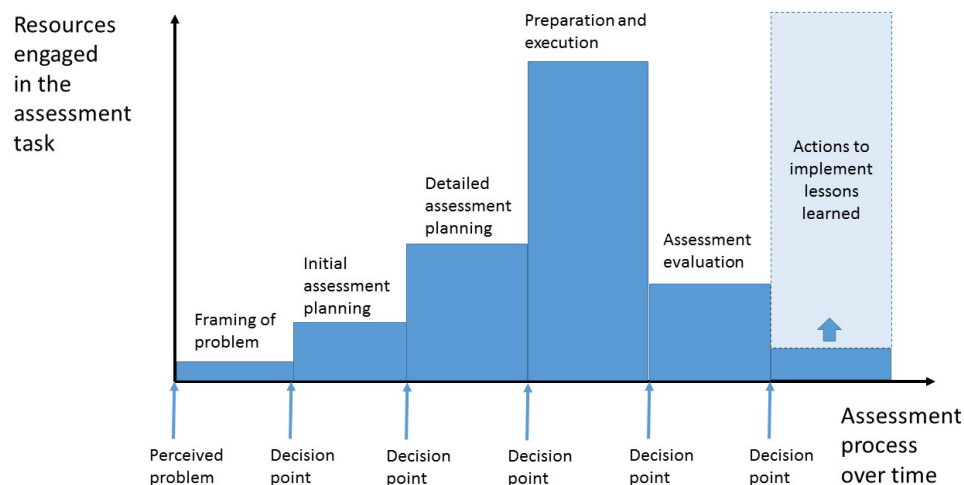
- Step 1) **Framing the Question** – In dialogue with the owner of the problem, in this guide the commander, the basic aspects of the question and the underlying problem space and available resources for initiating the next step in the work is clarified. The first section concludes with a decision by the commander whether to make an initial analysis of the problem. The decision should include a clearly defined “commander’s problem statement” and which resources are available for initial planning. The process in detail is outlined in Section 2.1 of this report.
- Step 2) **Initial Problem Analysis** – An assessment team executes a brief initial planning of the assessment task. The planning team reviews and develops the “commander’s problem statement”. The result of this work is presented in a “planning brief”. The aim is to be able to decide whether the assessment is worth the effort. Based on the information given at the brief, the commander decides on how to proceed. The process in detail is outlined in Section 2.2 of this report.
- Step 3) **Detailed Assessment Planning** – The assessment team, eventually expanded with additional resources, then makes an in depth planning of the assessment task. This includes development of a detailed assessment plan including definitions of indicators and corresponding procedures to collect information about these indicators. The result from the assessment planning is presented in an “assessment brief”. Based on the information given at the brief, the commander decides on whether to proceed or not with the assessment. The process in detail is outlined in Section 2.3 of this report.
- Step 4) **Preparation and Execution** – The assessment team then manages the practical preparation and execution of the assessment, e.g. collection of information/data about the identified indicators, with their assigned resources. The phase results in a compiled set of data/information about the stated problem. The results are presented in a first impression brief. The process in detail is outlined in Section 2.4 of this report.
- Step 5) **Analysis and Reporting** – The assessment team analyses the compiled data. The approach for how to do this is highly dependent on the specific contextual circumstances and should be defined in the

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<sup>1</sup> During the detailed planning, regular update briefs on how the planning proceeds are normally given.

assessment plan. The main expected outcome is of course an answer on the stated problem. In addition, the team should also make an assessment on the quality of the obtained data. The result is presented in a “results brief”. Based on the information given at the brief, the commander decides on any further action. The process in detail is outlined in Section 2.5 of this report.

The steps above can also be viewed from a resource perspective. Successively more and more resources are used for each step up until the preparation and execution step which presumably is the most resource intensive phase. The subsequent analysis and report phase is less personnel intensive. Of course, resources needed for the final step, actions to implement lessons learned, varies depending on the addressed problem. These resource considerations are illustrated in Figure 3.

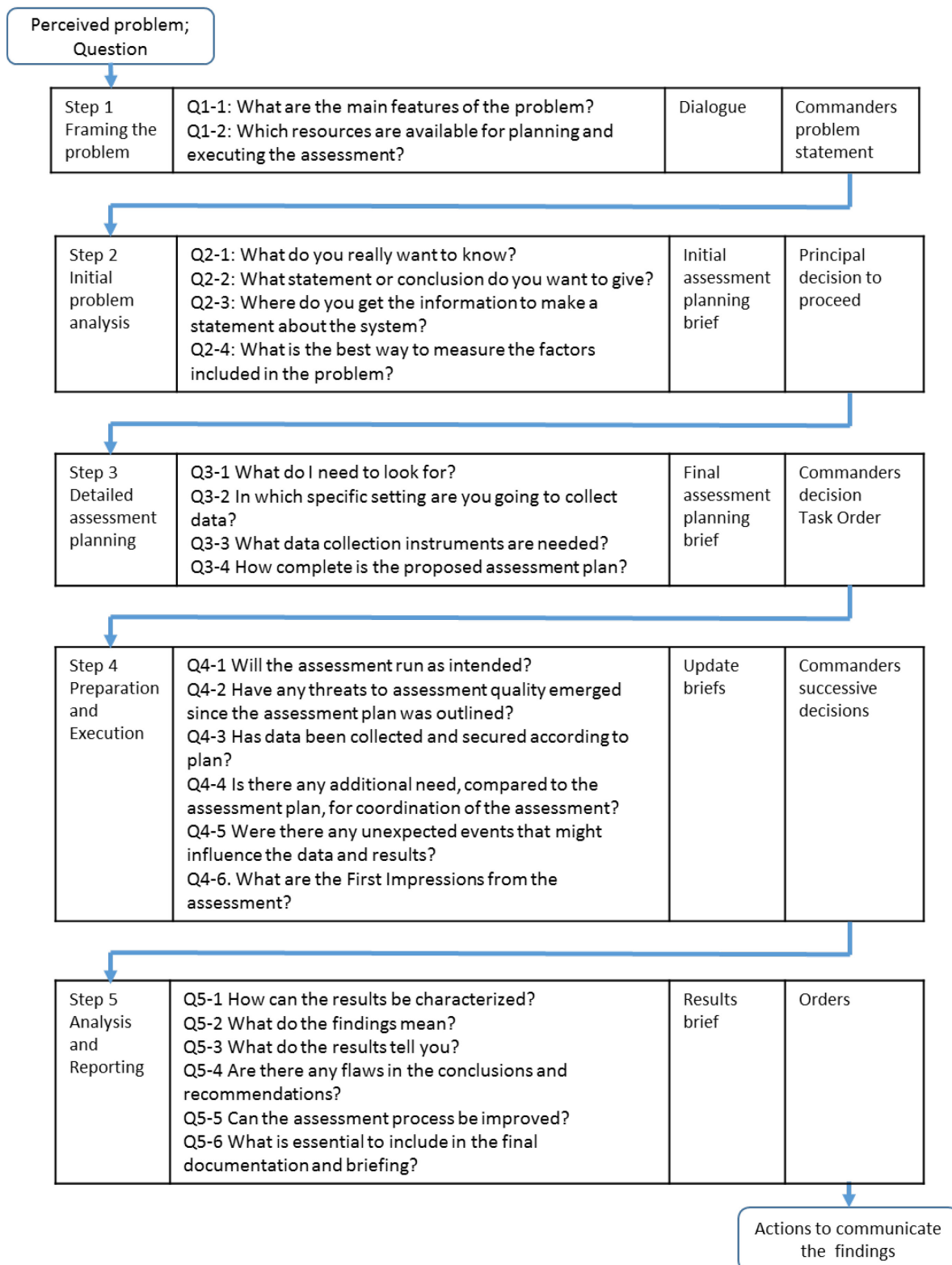


**Figure 3: The Assessment Process is Based on a Stepwise Decision to Engage Resources on the Assessment Task.**

The assessment process is initiated when a question is raised or problem encountered with the information to answer lacking, which may be coming from an intern or external source. One assumption in this guide is that the commander has the final say on how resources are used. Consequently, even if it is not the commander who is the “owner of the problem” the process is designed around a series of successive decisions made by the commander. In practice, it might be necessary to get approval from other stakeholders – “problem owners” – as well. For the purpose of this guide, the term commander is used to indicate the individual who has the mandate to make the adequate decisions to bring the process forward.

The decision points included in the assessment process give the commander the opportunity to adjust or even halt the assessment task in case resources are needed elsewhere. Consequently, the process is deliberately designed to minimize the use of resources for each step. A small team has a “first look” at the problem and suggest a way to address it before a more detailed planning is executed. If a problem which initially seemed manageable turns out to be too resource demanding for the staff to handle, the assessment task should be halted as early as possible and, if the problem is significant, external resources requested.

The Guide gives substantial attention to deepening the understanding of what really the question or problem is. This helps to achieve a good cost-benefit trade-off and optimal use of resources. The steps after the conclusions are drawn and the answer to the question is given, e.g. implementing the new tool or new way of working are beyond the scope of this Guide.



**Figure 4: Guide for the Assessment Process in Five Steps and Twenty-Two Leading Questions.**

## **2.0 GUIDE**

### **2.1 Step 1: Framing the Question**

The trigger for setting up an assessment process often comes from an emerging problem, a new tool, new conditions, thus in general an uncertainty about something that results in a question (e.g. why, what, how). Such question can come from inside or outside the organisation unit. It is assumed that the answer and information for the answer is not readily available and requires a more elaborate analysis and experimentation, i.e. trying out.

Framing the question or problem is intended to get to what the problem really is about. This will ascertain to find an answer to the right question. Also this will help to use the resources for the assessment as efficient as possible. Exploring the fundamental aspects of the problem and available resources is explored and clarified in the format of a dialogue. The dialogue addresses the questions presented in the sub-sections below.

#### **2.1.1 Q1-1: What are the main features of the problem?**

The question or expressed need must be developed into an explicit formulated problem statement - why it is a problem, covering the basic characteristics of the problem. In this context three major problem types can be distinguished:

- A conditions or input problem. Problems with available structures or resources – people, materiel, finances, procedures, e.g. are available resources insufficient or inadequate?, or the procedures are not aligned with the (new) setup?
- Problems with how available resources are transformed and used – process problem. For example, although adequate resources, are the processes in which the resources are used insufficient or inadequate?
- Problems with performance – output problem – for example, although having adequate resources and processes according to best practices, is performance insufficient or inadequate?

#### **2.1.2 Q1-2: Which resources are available for planning and executing the assessment?**

Resources for carrying out the planning task must be clearly defined. The following, non-exhaustive, considerations could be clarified:

- What are the time constraints?
- What kind of knowledge/expertise is necessary to include in the planning team?
- Are there any specific needs of equipment, facilities or technology?

The section is concluded with a decision by the commander, as direct or delegated problem owner, whether to make an initial analysis of the problem. The decision should include a clearly defined “commander’s problem statement” – roughly corresponding to “commander’s intent”. The decision should also include of which resources can be used for the next step – initial problem analysis.

### **2.2 Step 2: Initial Problem Analysis**

The person tasked for the assessment may need to build an assessment team in order to be able to perform the initial analysis of the assessment task. The intent is to have a first look, without digging too much into details, on what it takes to complete the assessment and what the potential gains are.

The result of this work is presented in an “initial planning brief”. The content of the brief should give an overview of what it takes to execute an assessment. The aim is to give an overview with enough information to make it possible for the commander to decide whether the assessment is worth the effort – primarily whether it is worth initiating a more detailed planning. Based on the information given at the brief, the commander decides on how to proceed and with which resources.

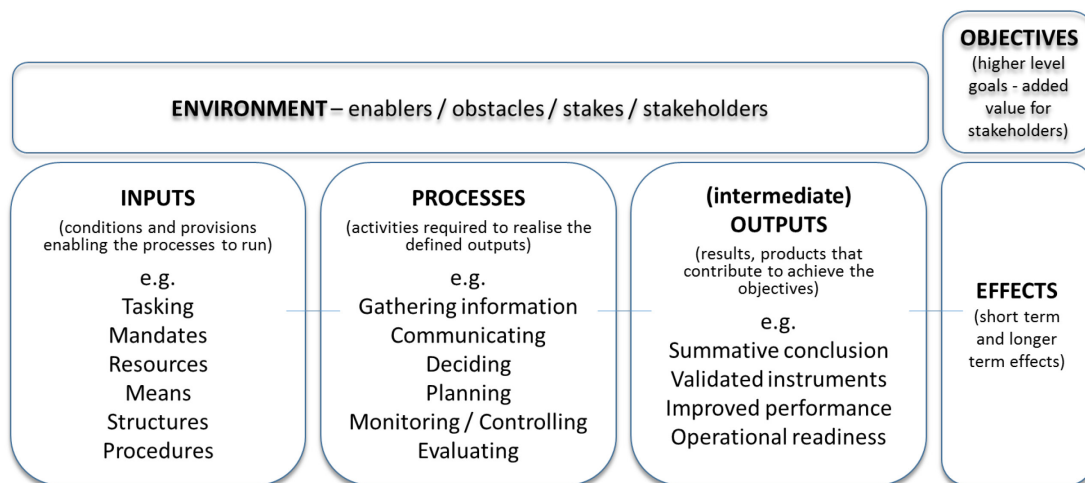
The first effort in the development of the assessment is to define what really the problem behind the question is and which stakeholders are related to this. Initial formulations of a problem statement often come with an implicit analysis or solution. This step is to identify the problem behind the stated problem to avoid potential biases.

The initial problem analysis should address the questions presented in the sub-sections below.

### 2.2.1 Q2-1: What do you really want to know?

This is about reviewing and developing the “commander’s problem statement” developed in dialogue with the commander. The primary aim is to deepen the initial analysis with a broader set of people and expertise in the team. By taking a systems perspective (Figure 5) it is possible to precisely define:

- What system to study (that is the integral setting of Inputs, Processes, and Output in Context)?
- What outputs is the system set up for to realise?
- What effects are assumed to result from the system’s outputs?



**Figure 5: A System Perspective on Defining the Problem, with Example Items to Address.**

Based on the commanders problem statement, potential relations between input, process and output factors should be outlined. For example, if there is a problem with available resources (input), specify some possible explanations how this has an effect on processes and output<sup>2</sup>. See also Ref. [7] for an explanation on the use of a systems perspective.

<sup>2</sup> Note that the system perspective is not the same as “organisational processes”. Instead it is about outlining how the core problem as defined by the answer to question Q1-1: “What are the main features of the problem?” might be influenced and is influencing other important factors.

### **2.2.2 Q2-2: What statement or conclusion do you need to give?**

This is about finding out what statements or conclusions are needed or expected in the communication about the results - when is the result considered to be convincing, a criterion for follow-on decisions. For instance, if a substantial improvement of the throughput of a process is being sought, a large time gain may be the objective. Also, if the result of the assessment is a source for decisions on, e.g. a substantial commitment, then extra considerations may be advised in setting up and measuring the effects. In other words, this step is about verifying that the assessment set-up addresses the perceived problem to a desired criterion level.

### **2.2.3 Q2-3: Where do you get the information to make a statement about the system?**

This is about defining a setting in which it is possible gather information about the assessment. The setting should be defined in four elements:

- Context. The operational setting and the scenario in which the system performs.
- Actors. For example, the units, opponents, stakeholders involved.
- Environment. For example, weather, ground conditions
- Content. For example, the critical events in the scenario.

Concerning the operational setting, experimentation in practice are being done in diverse context, but rarely in real operations. The possibility to experiment with new procedures or new tools can in, e.g. a Command Post Exercise (CPX) or Computer Assisted Exercise (CAX). All depends on how much time and manpower the commander sees as adequate to include in the exercise. This may also count for Live Exercise (LIVEX) although there time-space relations critically limit experimentation. If the seriousness of the question or problem requires a high level of control, such as, e.g. different groups working in parallel, than a specific setup independent of other stakes may be necessary.

### **2.2.4 Q2-4: What is the best way to measure the factors included in the problem?**

One can say, that the stronger the results statement needs to be, the stronger the measurement methods need to be. In general the combination of multiple methods makes the assessment stronger. Measurement methods that can be used during field studies are observations, questionnaires, and objective measures. Table 1 summarizes the general characteristics of the different measurement methods regarding different factors. Specific useful methods that can be found in the literature can be added to these general methods. For instance, communications analysis can be used to analyse the processes of interaction as part of collecting Observations data (e.g. counting the turn taking), or as an objective measure, e.g. using time dimension of communications.

**Table 1: Measurement Methods.**

	<b>Observation</b>	<b>Questionnaire / Interview</b>	<b>Objective Measures</b>
Input: Resources and Restrictions	Observers assess level or characteristics of resources and conditions for process	Ask participants how the perceived available resources and input conditions	Log and count resources and input conditions
Process: Behaviour	Observers assess quality of Process and score behaviour	Ask participants to assess the process and how they or others behaved	Log process and count if certain processes took place, and how much they were shown
Output: Performance	Observers assess quality of performance	Ask participants to assess their own or others' performance	Give objective score on task

Outline some options for how to use different measurement methods to study the problem on basis of:

- Does it measure the outcome you want it to measure?
- Can it be incorporated in the experimentation setup?

The answers to the questions of the “initial problem analysis” are summarized and presented in a brief to the commander including the following items:

- Defined Problem statement with comments from the planning team.
- Background to the perceived problem.
- Rationale (if applicable): Why this is an important problem?
- Goal (if applicable): What is the expected “end state” of an assessment?
- Time (if applicable): When is an assessment of the problem necessary to be completed?
- Suggested design options:
  - What do we need to know in order to resolve the problem?
  - How can we get this information?
  - Preferably two to three options with a preferred choice?
- For each option: Which resources are necessary for the assessment. Is the assessment task possible to solve with available resources or is it necessary to include external support?

As in any other planning task the commander has to make the decision on whether to proceed. The decisions concerns to give the order to the assessment team to execute the planning with defined resources and time constraints in order to assess a problem specified in the “commanders problem statement”.

### **2.3 Step 3: Detailed Assessment Planning**

The assessment team, possibly augmented with additional resources, then makes an in depth planning of the assessment task. The work of preparing the assessment is important as it determines the possibility success.



The objective is that the question, the measures and assessment design are specified in a plan: Specific, Measurable, Achievable/Agreed, Realistic, Time-bound (SMART). The development of the detailed assessment plan includes definitions of indicators (what is being measured) and corresponding procedures to collect information about these indicators.

The result from the assessment planning is presented in an “assessment brief”. Based on the information given at the brief, the commander decides on whether to proceed or not with the assessment.

The preparation phase should address the questions presented in the sub-sections below.

### **2.3.1 Q3-1: What do I need to look for?**

This is about outlining the details of the statement or conclusion you want to give defined in question Q2-2. For each identified factor or system characteristic a number of measures should be identified, e.g. a concrete formulation of what to assess. The following sub questions might serve as a guideline:

- What are the important characteristics of the input factors?
- In which way might they vary?
- What different forms may the implementation of the processes take?
- What other factors might be of relevance?

Multiple measures for each factor may be defined. The principle is illustrated in Table 2.

**Table 2: Example of a Table Showing the Connection Between Factors and Measures.**

<b>Factor</b>	<b>Measure</b>
Output factor F1	Candidate measure F1.1
	Candidate measure F1.2
Output factor F2	Candidate measure F2.1
Process factor F3	Candidate measure F3.1
	Candidate measure F3.1

### **2.3.2 Q3-2: In which specific setting are you going to collect the data?**

This is about designing different options for carrying out the assessment, e.g. the outlining the details of the context in which data will be collected. The following sub questions might serve as a guideline.

- What activities are in the focus of your assessment?
- What scenario matches best the activities under assessment?
- When and where are you going to collect data?
- What is the best setting for the assessment?

It is recommended that a few representative activities are selected in order to focus the measurement and manage the resource costs of the measurement. Selecting such activities may be self-evident after the previous questions have been completed.



A general consideration is whether to use the ‘natural’ day-to-day business as a setting for the assessment, or if it is necessary to create a specific setting for assessing. It might be necessary to insert events or stimuli that trigger the behaviours. Mostly, a natural setting may be appropriate and authentic, but can be problematic because of operational risks, interfering with actual processes, limited opportunity of measurement, the focal activity occurs rarely.

The elements of the focal activities that are going to be measured are defined and represented in a timeline/process map for the focal activity with an indication of when and where the measures will be taken.

### **2.3.3 Q3-3: What data collection instruments are needed?**

This is about defining the details about how to gather detailed information about the factors and measures. The following sub-questions might serve as a guideline.

- How does each factor and measure present itself in the organization?
- What measurement methods are appropriate?
- What is the specific measurement task? For example: which specific questions to ask in a questionnaire?

Ideally, multiple measurement methods should be defined to gather information concerning a single candidate measure. The principle is illustrated in Table 3.

**Table 3: Example of a Table Showing a Summary of Measurement Methods and Measures for the Different Factors.**

<b>Factor</b>	<b>Measure</b>	<b>Measurement Method</b>
Output factor F1	Candidate measure F1.1	Observation F1.1
		Questionnaire F1.1
		Interview F1.1
	Candidate measure F1.2	Questionnaire F1.2
		Observation F1.2
	Candidate measure F1.3	Questionnaire F1.3
		Interview F1.3
Process factor F2	Candidate measure F2.1	Observation F2.1
		Log F2.1
	Candidate measure F2.2	Observation F2.2

### **2.3.4 Q3-4: How complete is the proposed assessment plan?**

This is about creating a feasible assessment plan, which meets time, resources, and cost constraints. The following sub questions might serve as a guideline. Sample, non-exhaustive, questions are:

- What is the budget to support the assessment?
- How many people will be on the core assessment team?

- Which expertise is necessary to include in the team?
- Are there any time constraints regarding data collection?
- Are there any time constraints regarding analysing and interpret data?
- Are there any time constraints to make a final report or briefing?
- Are there any the risks and opportunities associated with the assessment, what actions you can take when these occur, and what resources might be consumed or saved by them?

Based on these considerations a more detailed assessment plan can be outlined. This means to decide on the scope of the assessment for each selected measure. How many participants will be involved in the assessment? How many times will the focal activities be observed? How much data will be collected? Note that it is rarely necessary to do a comprehensive survey or observation, such as surveying everyone in the brigade or observing every instance of a focal activity. In most cases, a smaller typical sample will provide a good estimate. On the other hand, to set up a naturalistic situation a diversity of participants may be needed even from outside the sourcing unit.

Analogical to a tactical plan, the assessment plan is a written script that describes in detail what has to be done, at what time, and who is responsible for the execution. The format of the assessment plan will vary between assessment tasks. Irrespective of format, it should minimally include an answer to the following aspects:

- Scenario setting:
  - The content and timing of the scenario and events.
  - Necessary preparations for the scenario and events.
  - Characteristics of participants.
  - How to motivate participants to engage in the assessment.
  - The information briefing and framing of the mind-set of the participants.
  - Instruction and debriefing of participants.
- Measurement:
  - Data collection time line.
  - How different kind of instrument of measurement will be used.
  - Rotation schedule, including time needed for different parts of the assessment.
  - How to secure data.

Subsequently, the answers to the questions in the preparations phase are summarized and presented in a brief to the commander including the following items:

- Recapitulation of the perceived problem.
- Recapitulation of the rationale: Why this is an important problem?
- Recapitulation of the goal: What is the expected “end state” of an assessment?

- Assessment design: How to execute the assessment:
  - What do we need to know in order to resolve the problem (which factors to collect data on)?
  - How do we get this information?
  - Timeline of assessment.
  - Which resources are necessary for the assessment?

The written assessment plan, together with ready-to-use versions of data collection instruments, questionnaires, observer protocols, etc., are enclosed with the briefing material.

## 2.4 Step 4: Preparation and Execution

During the Prepare and Execute phase, the data collection plan is carried out. The assessment team manages the preparation and execution of the assessment, i.e. collection of information/data about the identified indicators, with their assigned resources. Actions are undertaken in order to coordinate efforts and to assure quality of collected information. This step results in a compiled set of data with information about the stated problem. The results are presented in a first impression brief.

The execution phase is divided into three sub-phases:

- Before the actual assessment.
- During the execution of the assessment.
- Directly after the assessment is completed.

During these sub phases, a number of questions should continuously be addressed.

### 2.4.1 Sub-Phase: Before the Actual Assessment

This is about the final checks before the assessment is initiated, performing dry runs to verify if all technical aspects of the assessment.

#### 2.4.1.1 Q4-1: Will the assessment run as intended?

This is about ensuring that the assessment plan is adequately implemented. Before of the assessment, different parts of the study (i.e. the system, measurement methods, instruction) should be tested to assess whether they work like they are supposed to in the time scheduled for it. Consequently, a trial run of the assessment is desirable as it allows for flaws in the system or in the scenario to be discovered before the actual study.

Ideally, such trial runs can be executed already during the detailed planning. However, in many cases necessary resources might not be available during planning. For example, units participating in the assessment might have other tasks to solve. Still, some parts of the assessment process can be tested early without excessive resource investment. For example, questionnaires might be tested on representative individuals.

#### 2.4.1.2 Q4-2: Have any threats to assessment quality emerged since the assessment plan was outlined?

When the assessment has been initiated, time will most likely be a limiting factor for success of the execution. Failure in equipment or misunderstandings in the schedule could have a devastating effect. Moltke's famous

statement that “No campaign plan survives first contact with the enemy” (originally in Ref. [9], found in Ref. [10]) is true for the assessment task as well.

The use of checklists to review the assessment design setting on a regular basis is recommended. The basic content of such checklists are:

- Equipment – all equipment necessary for the assessment. Experience shows that an early check of functions in systems every morning during the execution has spared much of the assessment problems.
- Schedule and logistics – are there any frictions (i.e. meals, security clearance, transports) that can be solved in advance.
- Personnel – if there is any deviation in the planned manning. This must be noted so that it can be included in the analysis. The simplest way of doing this is to create a template with observed deviation, what task this role had, how the shortage was handled and the estimated effect of this deviation.

Deviations should be noted, in order to be able to include these in the analyses.

Daily assessment team meetings in order to *Synchronize actions in advance of assessment activities* aims to make sure that everyone knows what to do, how to do it, and how the assessment team’s activities should be coordinated. In these meetings, the schedule for the day(s) should be reviewed and in order to adjust instructions for data collection, and discuss any other coordination needs.

## **2.4.2 Sub-Phase: During the Execution of the Assessment**

This is about monitoring the assessment process and managing unexpected events in the light of the assessment objectives and plan. Especially with a large assessment team, collecting data in a limited amount of time, within a setting where regular updates on the assessment are expected a *Daily Assessment Team Meeting* (DATM) is required.

The purpose of these DATMs is to review the assessment activities and data gathered and the progress of the assessment and allocate actions when adjustment is needed. Ideally, the commander or an individual assigned by the commander takes part in the meeting. The DATM should address a number of questions related to data collection, assessment obstacles, additional resources or help, indicative intermediate assessment results. The DATM concludes with a preview of events and actions the following day.

### **2.4.2.1 Q4-3: Has the data been collected and secured according to plan?**

This is about reviewing the data collection plan and check if all data has been obtained. Has the assessment team access to obtained data or are there any additional actions needed to secure data?

### **2.4.2.2 Q4-4: Is there any additional need, compared to the assessment plan, for coordination of the assessment?**

This is about adjusting the plan for upcoming data collection efforts in order to address any identified but unforeseen changes in circumstances.

### **2.4.2.3 Q4-5: Were there any unexpected events that might influence the data and results?**

This is about deciding whether the circumstance under which data was collected was adequate to arrive at a solid conclusion on the assessment question.

The notes or decisions of the DATM are documented in a Daily Activity Note. Deviations from the plan that may influence the data should be documented and taken into consideration during subsequent analyses. The simplest way of doing this is to create a template with the columns:

- Observed event and deviation.
- When did it occur?
- Who is responsible for handling?
- How was it handled?
- What is the estimated effect of this deviation?

### 2.4.3 Sub-Phase: Immediately After the Assessment is Completed

This is about the initial analysis of obtained data, with first impressions.

#### 2.4.3.1 Q4-6: *What are the first impressions from the assessment?*

At the end of the assessment session often a so called ‘hot wash-up’ is organised for immediate feedback of first impressions to the participants. In general, after such assessment session participants, and in particular those from outside the unit, will distribute and involved in other activities, so that this may be the only moment to get some idea about the results. Input for such briefing comes from the daily observations. Since a First Impression generally lacks serious analysis of the data gathered, it is best is to stay away from interpretations or meaning and stick to the factual observations. The same counts for discussing preliminary results with stakeholders directly after the execution. If a First Impression Report is required one could focus on:

- The purpose and the objectives of the assessment.
- How what data were collected and how the collection process went.
- Presenting descriptive data (e.g. how many people filled out the questionnaire).
- Presenting preliminary results, factual observations or data (not conclusions!), consisting of simple aggregations of raw data.
- Describing the further analysis process and projected delivery of the full report.

Presenting preliminary results may have an *opportunity* to get feedback from the participants, which may support the analysis and interpretation of the data. For example, participants may be able to give there state of mind or contextual background related to particular events and decisions or actions they performed during the session.

## 2.5 Step 5: Analysis and Reporting

After the completed assessment, the data collected during the execution are analysed, interpreted, and reported by the team. The approach to do this is highly dependent on the specific contextual circumstances and should be defined in the assessment plan. The main result should the answer on the stated problem.

In addition, the team should also make an assessment on the quality of the obtained data. The result is presented in a “results brief”. Based on the information given at the brief, the commander may decide on any further action.

The analysis and report phase is divided into three sub phases:

- Analyse and interpret;
- Review findings; and
- Reporting.

### **2.5.1 Sub-Phase: Analyse and Interpret**

This is about condensing and characterising the obtained data from the assessment and subsequently considering the implications from these findings.

#### *2.5.1.1 Q5-1: How can the results be characterized?*

The data may initially be in written form, on questionnaires, rating sheets, or various other formats. It is helpful to gather them up onto spreadsheets in order to do adequate analyses, e.g. calculations of quantitative data such as averages or qualitative sum-ups or content analysis of qualitative data. The aim is to characterize the outcome based on the collected data.

Table 4 illustrates the principle for how the outcome from the collected data should be connected to the different factors. Each set of data is represented by a summary of the findings. Depending on the nature of the collected data, this summary might vary but it is typically a mean value, a summary of comments, most selected items, etc.

**Table 4: Example of a Table Showing How Outcomes Could be Connected to the Different Factors.**

<b>Factor</b>	<b>Measure</b>	<b>Measurement Method</b>	<b>Summary of Obtained Results</b>
Output factor F1	Candidate measure F1.1	Observation F1.1	A majority of decisions was regarding ...
		Questionnaire F1.1	Subjects generally preferred ...
		Interview F1.1	Subjects mentioned ...
	Candidate measure F1.2	Questionnaire F1.2	Mv 4,1 and 3,7
		Observation F1.2	Two alternatives were used ...
	Candidate measure F1.3	Questionnaire F1.3	The options were ranked in the following order ...
		Interview F1.3	Subjects were positive regarding ...
Process factor F2	Candidate measure F2.1	Observation F2.1	System was mainly used by...
		Log F2.1	The system was accessed ...
	Candidate measure F2.2	Observation F2.2	No observed deviations from ...

### 2.5.1.2 Q5-2: What do the findings mean?

Subsequently, results should be qualified in terms of what these results mean? Is there a change or a difference? Three basic approaches can be used answer this question. Which method is feasible depends on the design of the assessment.

- Comparing results with a norm or criterion.
- Comparing results over time for each unit including a control unit with no intervention.
- Comparing the results between units being each other's benchmark.

Consequently, this is about deciding whether the outcome was according to what was expected or not. For example, did the limitations in the input factor affect process and output factors as expected? Was the process executed according to standards? Was performance in line with the expected?

Table 5 illustrates the principle on how this interpretation should be connected obtained results for the different factors.

**Table 5: Example of a Table Showing the Assessment How What  
Different Obtained Results Indicate in Terms of Performance.**

Factor	Measure	Measurement Method	Summary of Obtained Results	Indicates
Output factor F1	Candidate measure F1.1	Observation F1.1	A majority of decisions was regarding ...	Better performance
		Questionnaire F1.1	Subjects generally preferred ...	Lower performance
		Interview F1.1	Subjects mentioned ...	Not conclusive
	Candidate measure F1.2	Questionnaire F1.2	Mv 4,1 and 3,7	Better performance regarding ...
		Observation F1.2	Two alternatives were used ...	Better performance
	Candidate measure F1.3	Questionnaire F1.3	The options were ranked in the following order ...	Lower performance
		Interview F1.3	Subjects were positive regarding ...	Better performance
Process factor F2	Candidate measure F2.1	Observation F2.1	System was mainly used by ...	Process according to expected ...
		Log F2.1	The system was accessed ...	Process deviated ...
	Candidate measure F2.2	Observation F2.2	No observed deviations from ...	Not conclusive

Subsequently, the picture given from the most “important” indicators are summarized. What does the findings say about the “commander’s problem statement”?

It is also recommended that indicators pointing in another direction are mentioned and explained. In addition, identified problems in the assessment should be commented.

#### *2.5.1.3 Q5-3: What do the results tell you?*

This is about analysing the obtained findings in terms of whether the outcome was according to what was expected or not. What are the implications? Are there any lessons learned? Are there any recommendations?

There is no unanimous and structured way to come up with a conclusion. However, each statement in the conclusion should be supported by obtained data, commonly accepted knowledge, or “obvious” circumstances. Finally, the conclusions should also hold some recommendations for the future.

The assessment is the summarized in a suitable format. Irrespective of format, the documentation should include the following major components:

- Introduction and background to the assessment.
- Methods – How the assessment task has been undertaken.
- Results – What are the characteristics of the obtained results? Was the outcome according to what was expected?
- Conclusions – For example, the answer to the assessment question and recommendations for the future.

### **2.5.2 Sub-Phase: Review Findings**

This is about quality check before the final conclusions and recommendations are presented to the commander.

It is also about learning from successes and failures in the process to improve the *assessment process* itself. The team should address two important questions during this sub phase.

#### *2.5.2.1 Q5-4: Are there any flaws in the conclusions and recommendations?*

Ideally, an After Action Review (AAR) or a so-called ‘Hot Wash-up’ should be held as soon as possible following completion of the assessment process. The basic scope of the AAR is to present and discuss the preliminary findings to relevant personnel which have been subjected to the assessment. An important objective is to collect additional data which might explain the obtained result. Another important objective is to anchor the results and its implications within the assessed units.

The AAR is a structured review or de-brief process for analysing *what* happened, *why* it happened, and *how* it can be done better, by the participants and those responsible for the assessment process. It can either be formal or informal depending on the size, timeframe and recourses available. These questions may be helpful in structuring an AAR:

- What was planned/expected?
- What actually occurred?
- Which results were obtained?



- Why did it happen?
- What went well and why?
- What can be improved and how?
- What are the important implications from the assessment?

In addition, if applicable, a draft version of the assessment report should be distributed to selected stakeholders for review and feedback.

Obtained comments and suggestions are subsequently incorporated in the final report.

#### 2.5.2.2 Q5-5: *Can the assessment process be improved?*

In parallel, feedback regarding the executed assessment should also be collected using ‘improve’ or ‘sustain’ (‘tips and tops’) questions with the assessment team and participants in the assessment.

### 2.5.3 Sub-Phase: Reporting

This is about Briefing and documenting the final results from the assessment.

#### 2.5.3.1 Q5-6: *What is essential to include in the final documentation and briefing?*

The evaluation report and corresponding briefing material should contain the relevant information to support a decision being made by the commander. More specifically, the Report should include:

- A concise statement of the issue prompting the assessment;
- The context, scope and aim of the assessment;
- A summary of the assessment’s conduct;
- A summary of the analysis;
- Key findings and recommendations; and
- Potential risks, confounding factors, and limitations.

In addition, it might also be appropriate to prepare a package of reference material. This includes compiled raw data, earlier briefing materials, relevant documents etc. Compilation of reference material is important as it will provide future assessments with adequate inputs.

## 3.0 CONCLUSIONS

The focus of this Field Assessment Guide is on experimentation or trying out in a natural context a new tool or way of working or the like – the intervention – to see if that improves the performance. The main techniques proposed in this Guide are:

- a) Deliberated thinking about what one really wants to know, understand, or find out;
- b) Detailed planning of trying out the effect of the intervention; and
- c) Doing this in a step-wise, documented approach enabling others to critical review it.

Historically, investments in military systems have often been of long term nature and thus research and system development had a perspective of decades in advance. Competence on implemented systems developed over time based on officers specializing on these systems and developing routine procedures. However, the last decades have shown that the lifecycle of systems tend to be drastically shortened. Rapid changes in threats, tactics, tasks, technology, and organization create a demand of an enhanced ability to develop technical and organizational solutions. We argue that constant change is currently the normal state for the Armed Forces. Consequently, competence cannot just be based on routine. The only way to adapt to change is to try out solutions to handle these changes. Competence on change will be a crucial factor in the process of establishing and maintaining combat ability. “Trying out” should become a more integrated and natural part of the Defence Forces every day activities. This guide is an attempt to address this challenge.

However, ‘just trying out’ means that we are aware and accept that there is relatively little control over possible confounding factors, such as, e.g. erroneously allocating the observed positive effect to the intervention while it may come from just the attention in setting up the trial or another source in the setup. Also the lack of independence of the assessment team may trick the team to seek for and report only the desirable results. Carefully designing an assessment is as important in a practice setting as would be in a scientific setting.

The discussions in the Task Group have shown that we easily shifted to scientific methods as these have been tested and developed and are well-proven to avoid biases and mistakes in assessments. Reducing that rigor and still maintaining the quality that is needed was indeed not easy to decide upon.

While this Guide is based on our practical experience it has not been tested and validated in practice. We suggest that the first steps in this could be done in the defence colleges and by the Training and Evaluation sections of the staffs. Feedback on the guide is highly welcomed.

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<b>14. Abstract</b>	<p>Rather than going for high level scientific rigor, this guide for field assessments by practitioners aims to provide a practical method to improve assessment efforts that might be based on simple methods of just observing if it works. Investing in simple measures to improve the assessment practise may reduce the number and magnitude of potential errors and misleading conclusions. The premise is that there is an identified need coming from the commander or staff or other stakeholder for an assessment to support a grounded decision, the Guide takes its user in five steps from problem exploration to planning and execution to reporting in five steps, closely following a command decision making model. While this guide in the current version is based on our practical experiences, it has not been tested or validated in practice. Feedback from defence colleges and Training and Evaluation staffs is highly welcomed.</p>		





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